

A.2.11 PLANETARY INSTRUMENT DEFINITION AND DEVELOPMENT

1. Scope of Program

The Planetary Instrument Definition and Development Program (PIDDP) supports the advancement of spacecraft-based instrument technology that shows promise for use in scientific investigations on future planetary missions. The goal of the program is not to develop flight-qualified hardware, but rather to define and develop scientific instruments or components of such instruments to the point where the instruments may be proposed in response to future announcements of flight opportunity without additional extensive technology development. The proposed instrument technology must address specific scientific objectives of candidate future missions. New measurement concepts can be proposed, as well as methods to significantly improve the performance of existing instruments and/or the development of technologies that enable integrated instrument packaging (architectures). The emphasis in this NRA is also on the development of miniaturized, low power, low cost instruments for Discovery-class and other similar missions.

Instrument definition and development studies can take place at several stages, from feasibility studies, to conceptual design, to laboratory breadboarding (but not brassboarding) of critical components and complete instruments. Particularly for immature or very complex new instruments, proposers initially may choose to only define or develop the most risky components. However, in all cases of component only development, one or more likely scenarios for possible follow on instrument development should be described. For all (instrument or component) proposals, scientific objectives of those instruments (or proposed follow on instruments), and future candidate missions should be discussed in the proposal. Proposed instruments must address significant scientific questions relevant to stated NASA goals.

Results of PIDDP work have contributed to the eventual development of flight hardware flown on or selected for many NASA missions. Since this is the goal of the PIDDP program, proposals should consider the potential of the proposed effort for enhancing future technology validation and science missions.

Because of the recent creation of the Astrobiology Science and Technology Instrument Development (ASTID) program (see Appendix A.6.4 in this NRA), astrobiology-focused instrument definition and development proposals should not be submitted to PIDDP, but rather should be submitted to ASTID. It is recognized that some instruments will overlap between the programs, e.g., instruments that do astrobiology and geochemistry. However, if the primary focus of a proposed instrument is astrobiology it should be submitted to ASTID, and otherwise it should be submitted to PIDDP. If a proposal really addresses both program elements somewhat equally, it can be submitted to both and overlap will be resolved at the programmatic level at the time of selections. Proposers should be aware that each of these programs has different constraints (e.g., developmental levels that are appropriate, timeframes of missions for which instruments

are being developed, appropriateness of nonspacecraft instruments, etc.), so proposers should carefully read the relevant program descriptions.

Proposals not appropriate for the PIDDP are those that seek to develop laboratory instruments, ground-based or airborne telescopes, auxiliary instrumentation such as spectrometers for telescopes, onboard data processing or data compression studies, or any spacecraft technology that does not directly address science instrumentation.

While this program element will be advertised annually, the nature of specific efforts selected for funding will vary, *with emphasis in any given year placed on preparation for the nearest term missions for which instruments have not yet been selected*. However, there can also be support provided for long lead-time definition studies, for innovative approaches that may provide entirely new classes of instruments, for the development of new enabling technology for missions farther in the future, and/or for detector development studies that may advance the technology for a wide range of planetary instrumentation applications. Therefore, proposers are encouraged to relate their proposed efforts as closely as possible to specific future planetary missions and demonstrate how their technology addresses the scientific goals of these missions.

2. PIDDP-Focused Future Missions

Proposals for instrument definition and development for certain of the following future missions will be considered for funding through the PIDDP.

- *Discovery Program*

The Discovery Program is envisaged as a series of focused, quick-turnaround missions. Development time will be approximately 36 months. Solicitations occur approximately every 18-24 months. The Discovery missions may include flybys, orbiters, landers, airplanes, balloons, Earth orbiting telescopes, and sample return missions to a variety of solar system objects to study surface and atmospheric composition, thermal structure, meteorology, geoscience, topography, dynamics, and field and particle environments. Instrumentation and techniques addressing critical scientific questions in this broad range are appropriate development efforts under the PIDDP. Technology applicable to multiple missions and investigations will have higher priority for funding. Proposals for the development of new instruments for missions already selected for flight or selected for Discovery Phase A study and/or development will not be accepted under this NRA.

- *Mars Surveyor Missions*

The Mars Surveyor missions include orbiters and landers that utilize small to medium spacecraft. For upcoming missions, U.S. science instruments for the Mars Surveyor 2003 and Mars 2005 missions have already been selected. Any new PIDDP level developments funded as a result of this NRA will be too late for the 2007 mission, so proposals relevant to the 2007 mission are not appropriate under this NRA. Future

launches to Mars will occur approximately every 26 months. Scientific payloads will consist of small, lightweight, low power consumption instruments.

Instrument development proposals for both U.S. and international follow-on missions to Mars (i.e., beyond the Mars 2007 mission) are appropriate under this NRA. Instrument technologies for the *in situ* exploration of Mars are of particular interest for future missions. The PIDDP seeks new concepts for Mars surface science, including, but not limited to, potential instruments for radiometric age-dating, soil/rock mineralogy and chemistry, water/ice detection and characterization, drilling/coring, and atmospheric analyses. Some, but not all of these, are truly new and complex instrument concepts for planetary exploration. As such, proposers may choose to initially pursue only development of the most challenging components, as long as discussion of their connection to possible future instruments and scientific objectives is clearly discussed.

- *Outer Solar System Missions*

Missions to the outer planets and satellites are a specific NASA objective. At the time of the writing of this document, timing and elements of the outer planets program were being reconsidered. PIDDP solicits instrument concepts relevant to possible future outer planet missions, although proposers are reminded that emphasis in any PIDDP selection will be placed on preparation for the nearest term missions for which instruments have not yet been selected. This determination will be made at the time of selection based upon NASA's plans at that time.

3. Programmatic Considerations

Proposals are solicited under this NRA for instrument definition and development only for the missions or classes of missions described in Section 2 above. Therefore, all proposals submitted to PIDDP must specify:

- The mission or class of missions for which the proposed instrument is applicable. Instruments that might fly on a number of missions will be given priority over those applicable to only a single mission.
- The science objectives of the proposed instrument. The relationship between the science objectives and the instrumental capabilities must be clearly demonstrated. For those instruments applicable to many missions or capable of meeting multiple science objectives, examples of science objectives for the proposed mission or missions should be given.
- Technological advances to be pursued as an inherent element of achieving the science objectives. Proposers are also asked to identify potential mechanisms that could facilitate transfer of these technologies to other users, including the private sector, for possible application beyond the immediate one of meeting mission science objectives.

It is anticipated that the scientific payloads on all future solar system exploration missions will be limited to small, low mass, low power consumption, and low cost instruments. For this reason, only proposals for instrument definition and development satisfying these general specifications will be considered for support.

The evaluation criteria in the *OSS Guidebook – 2001* are fully applicable to the PIDDP, including evaluation of scientific and technical merit, relevance to NASA's objectives, and cost. In addition, however, the determination of a proposal's relevance shall also take into account the following factors:

- The extent to which the proposed instrument is applicable to multiple missions in the Exploration of the Solar System science theme and/or Origins of Solar System program element (see Section 2);
- The extent to which the instrument addresses a priority science goal of the mission or missions for which it would be a candidate for flight;
- Either the near-term nature of the mission or missions in question, or the necessity of embarking on a long lead-time development of a very important instrument contemplated for flight on a mission that is of high priority, even though it is not in the near-term queue; and
- Whether the instrument is deemed to fall within the scope of PIDDP, including whether it is too developmentally mature for PIDDP.

It should be noted that the contemplated sequence of missions described in this NRA is a best current estimate and is subject to change. NASA reserves the right to make a determination of relevance based on the contemplated sequence of missions as it is understood at the time of proposal evaluation and selection.

Full, new proposals are sought for either entirely new studies or for the extension of PIDDP studies terminating in FY 2002. Proposals may specify periods of performance of up to three years. It is expected that there will be approximately \$2.5M dollars available for new (and extension) proposals, and that 10 to 15 studies will be supported with these funds.

Status Reports: Holders of existing multiple year awards in this program that are entering their second or third year of a three-year award from a previous NRA for this program element must submit a Status Report. This Status Report should cover progress made toward completing the originally proposed research since the initiation of the award or last year's deadline for new proposals, whichever came last. This Status Report is due by the same deadline as for new proposals for this program element (see Table 1 or 2 in the Summary of Solicitation of this NRA). These Status Reports will be screened by the same peer review panel that will be convened to review new proposals as an aid to NASA's evaluation of existing awards. Such a *Status Report* should not exceed three single-spaced, typewritten pages with roughly two pages used for a description of the

progress made during the previous year and the remainder to a statement of the work planned for the coming year (Note: this three page limit does not include references, figures, reprints, or appendices). The Status Report should be prefaced by a copy of the proposal's original Cover Page submitted through the web at the same site specified for new proposals in the summary of solicitation of this NRA (Note: the home page for this program element will provide the option to designate whether the *Cover Page* is for a new proposal or Status Report). and a copy of the original approved budget. Any request for an augmentation to the budget relative to the current approved funding must be supported by detailed information in conformance with Section 2.3.10 of the *OSS Guidebook-2001*. Submission of hard copy of the Status Report must include an original and four copies. Also note that it is expected that within a year a new electronic proposal data system that is now under development will begin to automatically notify holders of existing awards 75 days in advance of their award's anniversary date to submit the Annual Progress Report that is required to implement the next funding supplement of the award. The implications of possibly calling for two reports per year of existing awards in this Program Element will be resolved by then.

IMPORTANT INFORMATION

As discussed in the *Summary of Solicitation* of this NRA, the Office of Space Science (OSS) is now using a single, unified set of instructions for the submission of proposals. This material is contained in the document entitled *NASA Guidebook for Proposers Responding to NASA Research Announcement – 2001* (or *NASA Guidebook for Proposers* for short) that is accessible by opening URL <http://research.hq.nasa.gov>, and linking through the menu item "Helpful References," or may be directly accessed online at URL <http://www.hq.nasa.gov/office/procurement/nraguidebook/>. This NRA's Summary of Solicitation also contains the schedule and instructions for the electronic submission of a *Notice of Intent* (NOI) to propose and a proposal's *Cover Page/Proposal Summary*, which now also includes the required *Budget Summary*, and the mailing address for the submission of a proposal.

As a modification to the default specification in the *Summary of Solicitation* of this NRA , 18 copies of the proposal are required, plus the signed original.

Questions about this program element may be directed to the cognizant Discipline Scientist:

Until April 1, 2002:

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After April 2, 2002, a new Discipline Scientist for this program will be announced as an amendment to this NRA.